REMARKS

Claims 1-17 were rejected under 35 U.S.C. § 102(e) as being anticipated by Griniasty (U.S. Patent Publication 2003/0088416).

CLAIMS 1-6

Independent claim 1 provides a method of segmenting words into component parts. The method includes determining a mutual information score for a pair of graphoneme units, comprising a first graphoneme unit and a second graphoneme unit. The mutual information score is determined using the probability of the first graphoneme unit appearing immediately after the second graphoneme unit, the unigram probability of the first graphoneme unit and the unigram probability of the second graphoneme unit. Each graphoneme unit comprises at least one letter in the spelling of a word. The mutual information score is used to combine the first and second graphoneme units into a larger graphoneme unit. In a dictionary comprising segmentations of words into sequences of graphoneme units, the first and second graphoneme units are replaced with the larger graphoneme unit in each sequence of graphoneme units in which the first graphoneme unit appears immediately after the second graphoneme unit.

With the present amendment, the limitation of replacing the first and second graphoneme units with the larger graphoneme unit in a dictionary comprising segmentations of words into sequences of graphoneme units has been added. This limitation is found on page 18, lines 6-10.

As amended, claim 1 is not shown or suggested by Griniasty. In particular, Griniasty does not show or suggest replacing first and second graphoneme units with a larger graphoneme unit in each sequence of graphoneme units in which the first graphoneme unit appears immediately after the second graphoneme unit.

In Griniasty, an alignment between phonemes and letters is determined in paragraphs [0015]-[0021] using a Viterbi detection scheme that scores the different possible alignments. During this alignment, Griniasty never replaces two graphoneme units with a larger graphoneme unit that has been formed by combining the two graphoneme units. In particular, paragraphs [0016] and [0017] of Griniasty do not show replacing two graphoneme units with a larger

graphoneme unit. Instead, these paragraphs discuss determining scores for sequences of graphonemes. When determining the scores for these graphonemes, the individual graphonemes are not replaced with larger graphonemes. This can be seen in block 76 where two possible graphoneme sequences are being considered. Each sequence is scored based on the individual graphonemes in the sequence. As such, the individual graphonemes are not being replaced by a larger graphoneme but instead remain intact. Further, when the system in Griniasty reaches the end of the Viterbi detector it backtracks to find all of the graphonemes in the sequence to provide the segmentation of the word. This backtrack would not be possible if the graphonemes had been replaced by larger graphonemes.

In addition, Griniasty does not show replacing two graphonemes with a larger graphoneme in a dictionary comprising segmentations of words. Instead, Griniasty scores possible sequences of graphonemes and selects the sequence with the highest score as the segmentation for the word. If two graphoneme units are next to each other in the selected sequence, they are not replaced by a larger graphoneme unit in the segmentation stored in the dictionary. Instead, the individual graphoneme units determined during the Viterbi search are stored in the dictionary.

Griniasty does discuss adding pairs of phones as single phonemes in paragraph [0023]. However, the phonemes do not constitute a graphoneme as they do not include at least one letter in the spelling of a word. Further, Griniasty does not show or suggest replacing pairs of phonemes with a single phoneme in each entry of a dictionary. Instead, the newly formed phonemes are used to perform a new Viterbi search to determine a new alignment between the phonemes and the letters of each word.

Since Griniasty does not show or suggest replacing first and second graphoneme units with a larger graphoneme unit in each sequence of graphoneme units in which the first graphoneme unit appears immediately after the second graphoneme unit in a dictionary, Griniasty does not show or suggest the invention of claim 1 or claims 2-6 which depend therefrom.

CLAIMS 7-15

Independent claim 7 provides a computer-readable storage medium having computer-executable instructions stored thereon that when executed by a processor cause the processor to perform a series of steps. The steps include determining mutual information scores for pairs of graphoneme units found in a set of words. Each graphoneme unit comprises at least one letter. Each mutual information score for a pair of graphoneme units is based on the probability of one graphoneme unit of the pair appearing immediately after the other graphoneme unit of the pair as well as the unigram probabilities of each graphoneme unit in the pair. The graphoneme units of one pair of graphonome units are combined to form a new graphoneme unit based on the mutual information scores. A segmentation of a word comprising a set of graphoneme units for the word that includes the pair of graphoneme units is updated by replacing the pair of graphoneme units in the segmentation with the new graphoneme unit.

With the present amendment, the step of updating a segmentation of a word by replacing a pair of graphoneme units with a new graphoneme unit has been added. This limitation is found on page 18, lines 6-10.

As amended, claim 7 is not shown or suggested in Griniasty. In particular, Griniasty does not show or suggest updating a segmentation of a word by replacing a pair of graphoneme units in the segmentation with a new graphoneme unit formed by combining the pair of graphoneme units.

In the Office Action, paragraphs [0013]-[0017] of Griniasty were said to show combining a pair of graphoneme units to form a new graphoneme unit based on the mutual information score. Applicants respectfully dispute this assertion.

In paragraphs [0013]-[0017], Griniasty does not show or suggest combining graphoneme units to form a new graphoneme unit. Instead, as discussed in paragraphs [0016] and [0017], Griniasty discusses how to score sequences of graphoneme units. In particular, in paragraph [0016], a score for a sequence of graphoneme units is said to be equal to the sum of the probability of one of the graphoneme units and the probability of the second graphoneme unit. Note that the graphoneme units used in the sum are not being combined. This can be distinctly seen for block 76 of Fig. 5. In this block, two separate sums are determined, one for a path from

square 68, and one for a path from square 70. These two separate paths are scored individually and one of the paths is selected based on the score (see paragraph [0016]). Note that both of these paths contain the same letters and same phonemes. As such, there would be no need to form two different scores if the letters and phonemes were being combined to form a larger graphoneme. Instead, square 76 indicates that two different sequences of graphonemes are being considered. There is no step of combining a pair of graphoneme units to form a new graphoneme unit. If there were, only a single graphoneme unit would appear in block 76.

In addition, Griniasty does not show or suggest replacing a pair of graphoneme units in a segmentation of a word with a new graphoneme unit to update the segmentation of a word. In Griniasty, there is no mention of replacing a pair of graphoneme units in a segmentation of a word with a new graphoneme unit formed by combining the pair of graphoneme units. In particular, paragraphs [0012]-[0017] of Griniasty do not show such an update step. There is no mention in these paragraphs of updating an existing segmentation that has a pair of graphonemes by replacing the pair with a single new graphoneme.

Since Griniasty does not show or suggest combining a pair of graphonemes to form a new graphoneme or replacing a pair of graphonemes in a segmentation of a word that contains the pair of graphonemes, Griniasty does not show or suggest the invention of claim 7 or claims 8-15, which depend therefrom.

CLAIM 16

Claim 16 provides a method of segmenting a word into syllables. The method includes segmenting a set of words into phonetic syllables using mutual information scores wherein using a mutual information score comprises computing a mutual information score for two phones by dividing the probability of the two phones appearing next to each other in the set of words by the unigram probabilities of each of the two phones appearing in the set of words. The segmented set of words is used to train a syllable n-gram model. The syllable n-gram model is then used to segment a phonetic representation of a word into syllables via forced alignment.

With the present amendment, the computation of the mutual information score has been described in more detail. Support for this amendment is found on page 16, line 4-page 17, line 3.

As amended, claim 16 is not shown or suggested by Griniasty. In particular, Griniasty does not compute a mutual information score by dividing a probability of two phones appearing next to each other in a set of words by the unigram probabilities of each of the two phones appearing in the set of words.

In the Office Action, the scores computed by Griniasty were said to be mutual information scores. However, the scores depicted in Griniasty are the log probability of a phone or a pair of phones emitting a letter and the log probability of two phones appearing next to each other. There is no indication of a log probability of two phones appearing next to each other being divided by the unigram probabilities of each of the phones appearing in a set of words.

Since Griniasty does not show or suggest determining a mutual information score as defined in claim 16, it does not show or suggest the invention of claim 16.

CLAIM 17

Claim 17 provides a method of segmenting a word into morphemes. The method includes segmenting a set of words into morphemes using mutual information scores wherein using mutual information scores comprises computing a mutual information score for two letters based on the probability of the two letters appearing next to each other in the set of words and the unigram probabilities of each of the two letters appearing in the set of words. The segmented set of words is used to train a morpheme n-gram model and the morpheme n-gram model is used to segment a word into morphemes via forced alignment.

Claim 17 is not shown or suggested in Griniasty. In particular, Griniasty does not show or suggest computing a score for two letters based on the probability of the two letters appearing next to each other in a set of words and the unigram probabilities of each of the two letters appearing in the set of words.

In the Office Action, paragraphs [0012]-[0017] of Griniasty were said to show the determination of the mutual information scores of claim 17. Applicants respectfully dispute this assertion. In the cited section of Griniasty, Griniasty only discusses emission probabilities. Each of these probabilities is the probability that a phoneme or a sequence of two phonemes would emit a letter. Thus, it is the probability of a letter string given the phoneme. These emission

probabilities are summed together to provide a score for an alignment between letters and phonemes for segments of words. However, none of the scores or probabilities provide the probability of two letters appearing next to each other in the set of words or the unigram probabilities of each of the two letters appearing in the set of words. There is simply no mention of a unigram probability for a letter appearing in a set of words.

Since Griniasty does not show or suggest the probability of two letters appearing next to each other in a set of words or unigram probabilities for individual letters appearing in the set of words, Griniasty does not show or suggest computing a mutual information score based on such probabilities and therefore does not show or suggest the invention of claim 17.
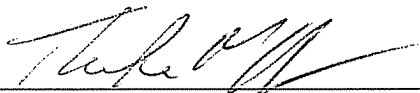
CONCLUSION

Based on the above remarks, claims 1-17 are in form for allowance. Reconsideration and allowance of the claims is respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

WESTMAN, CHAMPLIN & KELLY, P.A.

By:_____
Theodore M. Magee, Reg. No. 39,758
900 Second Avenue South, Suite 1400
Minneapolis, Minnesota 55402-3319
Phone: (612) 334-3222 Fax: (612) 334-3312

TMM:kjl